

## **REMARKS**

Reconsideration of the application is requested. To address issues under 35 USC 112, Claim 12 was amended for wording matters. Claims 4, 5, 14 and 15 were also modified to address wording issues.

### **Rejection Under 35 USC 112, second paragraph**

1. The Office Action indicated that the marked up version of amended Claim 12 was incorrect. In view of the modifications above, the rejection is believed overcome. Reconsideration is requested.

2. The Office Action rejected Claim 12 on the grounds that the term "reactive additive" lacked an antecedent basis. In view of the modifications above, the rejection is believed overcome. Reconsideration is requested.

3. The Office Action rejected Claims 4 and 14, on the grounds that the phrase "the oxide nitride" lacked an antecedent basis. In view of the modifications above, the rejection is believed overcome. Reconsideration is requested.

4. With respect to Claims 4 and 14, the Office Action also questioned whether the term "< 1%" referred to molar % or weight %. In view of the modifications above, the rejection is believed overcome. Reconsideration is requested. Support for the amendment can be found on page 8, line 13.

5. The Office Action rejected Claims 5 and 15 on the grounds that there should be an "and" before "alkaline earth." In view of the modifications above, the rejection is believed overcome. Reconsideration is requested.

### **Objections**

The Office Action objected to the specification on the grounds that the specification lacked a brief description of the drawings. In view of the modifications above, the rejection is believed overcome. Reconsideration is requested.

## **Rejections Under 35 USC 102**

1. Rejection of Claims 4-23 under 35 USC 102 over U.S. Pat. No. 5,998,319 or PCT WO 97/21644

The Office Action rejected Claims 4-23 under 35 USC 102 over U.S. Pat. No. 5,998,319 or PCT WO 97/21644 (Hintermayer). The rejection should be withdrawn in view of the remarks below.

It is well settled that a 35 USC 102 rejection must rest upon the literal teachings of the reference and that the teachings must teach every element of the claimed invention in as complete detail as is contained in the claim. In order for prior art reference to anticipate claim, the reference must disclose each and every element of claim with sufficient clarity to prove its existence in prior art. The disclosure requirement under 35 USC 102 presupposes knowledge of one skilled in the art, but such presumed knowledge does not grant license to read into prior art reference teachings that are not there. See Motorola Inc. v. Interdigital Technology Corp. 43 USPQ2d 1481, 1490 (1997 CAFC). Hintermayer does not anticipate Applicants' invention.

Applicants' invention relates to a silicon nitride material comprising sintering aids including at least  $\text{Al}_2\text{O}_3$ , and silicon dioxide, in a grain boundary phase. The silicon dioxide in the grain boundary phase and the sintering aids including at least  $\text{Al}_2\text{O}_3$  in the grain boundary phase have a molar ratio of silicon dioxide to the silicon dioxide and sintering aids including at least  $\text{Al}_2\text{O}_3$  that is  $> 60\%$  and the oxide nitride content is  $< 1\%$ . Applicants' invention is based on the discovery that the silicon material has, regardless of the way in which it is produced, a high corrosion resistance towards acids if it has a very high  $\text{SiO}_2$  content and formation of silicon oxide nitride is avoided (Spec., p. 2, 3<sup>rd</sup> full paragraph).

Hintermayer discloses a method of producing sintered silicon nitride comprising adding 5 to 20 wt % of at least one glass phase comprising at least one member selected from the group consisting of glass and glass components to silicon nitride to form a mixture, each of said silicon nitride, glass or glass components having a particle size of  $< 2 \mu\text{m}$ , in which the glass or glass components collectively

have a transition point  $T_g$  below  $750^{\circ}\text{C}$ ., and sintering said mixture at a temperature below  $1400^{\circ}\text{C}$ . to form the sintered silicon nitride.

Hintermayer does not anticipate Applicants' invention. Hintermayer's method for producing sintered silicon nitride by sintering silicon nitride powder with one or more glass components does not disclose Applicants' invention. Hintermayer does not contain a single word about an oxide nitride content ( $\text{Si}_2\text{N}_2\text{O}$ ), let alone a limit of the oxide nitride content of 1%. Hintermayer does not deal with the object of Applicants' invention. That is, Hintermayer does not provide ceramic materials based on silicon nitride which have a high corrosion resistance. Reconsideration is requested.

2. Rejection of Claims 4-23 under 35 USC 102 over U.S. Pat. No. 5,919,719 (Sato)

The Office Action rejected Claims 4-23 under 35 USC 102 over U.S. Pat. No. 5,919,719 (Sato). The rejection should be withdrawn in view of the remarks below.

Applicants' invention as encompassed by Claim 4, relates to a silicon nitride material comprising sintering aids that include at least  $\text{Al}_2\text{O}_3$  and silicon dioxide, in a grain boundary phase, wherein the silicon dioxide in the grain boundary phase and the sintering aids including at least  $\text{Al}_2\text{O}_3$ . The grain boundary phase has a molar ratio of silicon dioxide to silicon dioxide and sintering aids including at least  $\text{Al}_2\text{O}_3$  that is  $> 60\%$  and the oxide nitride content is  $< 1\%$ .

Sato is based on the discovery that a silicon nitride sintered body obtained by mixing an oxide of a rare earth element such as yttrium (Y) and  $\text{Al}_2\text{O}_3$  with a silicon nitride powder and firing the mixture, by precipitating Si (elemental silicon) in the tissue of sintered body, strength at a high temperature and toughness can be increased (See Summary of the Invention). Sato discloses a sintered body containing a  $\beta$ -silicon nitride crystal phase as a main crystal phase and containing a rare earth elemental component and an aluminum component in a grain boundary, in which the intensity ratio ( $X_2/X_1$ ) of a Si peak  $X_2$  at  $521\text{ cm}^{-1}$  to a silicon nitride peak  $X_1$  at  $206\text{ cm}^{-1}$  detected by a Raman spectrochemical analysis method is 0.2 to 3.

Sato does not anticipate Applicants' invention. The Office Action relied on the compositions in Table 1 in rejecting Applicants' invention. Table 1 includes Examples according to Sato's invention as well as comparative examples. With respect to the examples, according to Sato's invention, the molar ratio of silicon dioxide to the sintering aids is from 20% (sample No. 19) to 53.3% (sample No. 16). Most compositions have a ratio of 33% (samples No. 22-27) or 40% (samples No. 7-9). This means compositions according to Sato's invention have a molar ratio much lower than 60% being the lower limit in Applicants' claims. This also means that these compositions do not anticipate Applicants' invention. Reconsideration is requested.

With respect to the comparative examples, there is only one composition having a molar ratio of silicon dioxide to the sintering aids that is >60% (sample No. 1; 63.6%). However, this disclosure does not disclose Applicants' invention in every detail as is required by 35 USC 102. That is, Sato does not disclose a silicon nitride material comprising sintering aids including at least  $\text{Al}_2\text{O}_3$  and silicon dioxide, in a grain boundary phase, wherein the silicon dioxide in the grain boundary phase and the sintering aids including at least  $\text{Al}_2\text{O}_3$  in the grain boundary phase has a molar ratio of silicon dioxide to silicon dioxide and sintering aids including at least  $\text{Al}_2\text{O}_3$  that is > 60% and the oxide nitride content is < 1%. Reconsideration is requested.

### **Rejections Under 35 USC 103**

#### **1. Rejection of Claims 4-23 over Hintermayer**

The Office Action rejected Claims 4-23 over Hintermayer under 35 USC 103. The rejection should be withdrawn in view of the remarks below. It is well established that to establish a *prima facie* case of obviousness, the USPTO must satisfy all of the following requirements. First, the prior art relied upon, coupled with the knowledge generally available in the art at the time of the invention, must contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or to combine references (*In re Fine*, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988)). Second, the proposed modification must have had a reasonable expectation of success, as determined from the vantage point of one of ordinary skill in the art at the time the invention was made (*Amgen v. Chugai Pharmaceutical Co.* 18 USPQ 2d

1016, 1023 (Fed Cir, 1991), *cert. denied* 502 U.S. 856 (1991)). Third, the prior art reference or combination of references must teach or suggest all of the limitations of the claims (*In re Wilson*, 165 USPQ 494, 496, (CCPA 1970)). The Office Action did not establish a *prima facie* case of obviousness.

Applicants' invention, as encompassed by Claim 4, relates to a silicon nitride material comprising sintering aids that include at least  $\text{Al}_2\text{O}_3$  and silicon dioxide, in a grain boundary phase. The silicon dioxide in the grain boundary phase and the sintering aids including at least  $\text{Al}_2\text{O}_3$  The grain boundary phase has a molar ratio of silicon dioxide to silicon dioxide and sintering aids including at least  $\text{Al}_2\text{O}_3$  that is > 60% and the oxide nitride content is < 1%.

One of ordinary skill in the art following the teachings of Hintermayer would not have been motivated to modify Hintermayer and make Applicants' invention. Hintermayer's method for producing sintered silicon nitride by sintering silicon nitride powder with one or more glass components would not have motivated one of ordinary skill in the art to modify Hintermayer and make Applicants' invention. Hintermayer's teachings, which do not contain a single word about an oxide nitride content ( $\text{Si}_2\text{N}_2\text{O}$ ), let alone a limit of the oxide nitride content of 1%, simply lack the suggestive details required by 35 USC 103. Reconsideration is requested.

## 2. Rejection of Claims 4-23 over Sato

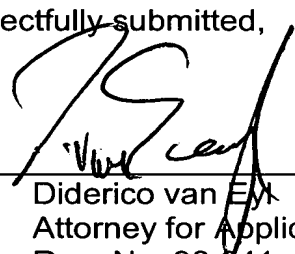
The Office Action rejected Claims 4-23 over Sato. Applicants' invention relates to a silicon nitride material comprising sintering aids including at least  $\text{Al}_2\text{O}_3$ , and silicon dioxide, in a grain boundary phase. The silicon dioxide in the grain boundary phase and the sintering aids including at least  $\text{Al}_2\text{O}_3$  in the grain boundary phase have a molar ratio of silicon dioxide to the silicon dioxide and sintering aids including at least  $\text{Al}_2\text{O}_3$  that is > 60% and the oxide nitride content is < 1%. Applicants' invention is based on the discovery that the silicon material has, regardless of the way in which it is produced, a high corrosion resistance towards acids if it has a very high  $\text{SiO}_2$  content and formation of silicon oxide nitride is avoided (Spec., p. 2, 3<sup>rd</sup> full paragraph).

One of ordinary skill in the art following the teachings of Sato would not have been motivated to modify Sato, make Applicants' invention, and expect the results Applicants' have obtained. Sato's sintered body containing a  $\beta$ -silicon nitride crystal phase as a main crystal phase and containing a rare earth elemental component and an aluminum component in a grain boundary phase would not have made one of ordinary skill in the art modify Sato, make Applicants' invention, and expect the results Applicants have obtained. Reconsideration is requested.

In view of the modifications and remarks above, allowance of all pending claims is earnestly requested.

Respectfully submitted,

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